# GUIDING PILLAR TRIM FOR A SIDE-CURTAIN AIRBAG SYSTEM

## DESCRIPTION

### TECHNICAL FIELD

**[Para 1]** The present invention relates generally to side-curtain airbag systems, and more particularly to a side-curtain airbag system having a guiding pillar trim for directing the deployment of a side-curtain airbag in a predetermined direction.

### BACKGROUND OF THE INVENTION

**[Para 2]** Side-curtain airbag systems for vehicles are well known. These systems typically are utilized for absorbing side-impact forces that could otherwise have been imparted upon a vehicle occupant's head and/or upper body. A typical side-curtain airbag system includes a crash sensor, an inflator device coupled to and actuated by the crash sensor, and a side-curtain airbag coupled to and inflated by the inflator device. The side-curtain airbag typically is stored within the headliner of the vehicle roof and deployed downward from that headliner.

**[Para 3]** It would therefore be desirable to provide a guiding pillar trim for directing the deployment of the side curtain airbag in a predetermined direction for providing substantial protection for the vehicle occupant.

### SUMMARY OF THE INVENTION

**[Para 4]** In one advantageous embodiment of the claimed invention, a guiding pillar trim for a side-curtain airbag system of a vehicle is provided. The guiding pillar trim includes a panel for covering a pillar structure of the vehicle. This panel has a guide member coupled thereto that is movable between a trim configuration and a ramp configuration. In the ramp configuration, the guide member directs the deployment of a side-curtain airbag in a predetermined direction.

**[Para 5]** One advantage of the present invention is that a guiding pillar trim for a side-curtain airbag system of a vehicle is provided that improves deployment of side-curtain airbags so as to enhance protection of the head and upper body of vehicle occupants in a side-impact collision and/or roll-over event.

**[Para 6]** Another advantage of the present invention is that a guiding pillar trim for a side-curtain airbag system of a vehicle is provided that has a substantially simple construction with few components for minimizing subassembly time and costs associated therewith.

**[Para 7]** Yet another advantage of the present invention is that a guiding pillar trim for a side-curtain airbag system of a vehicle is provided that has a substantially lightweight construction for maximizing the fuel economy of the vehicle.

**[Para 8]** Still another advantage of the present invention is that a guiding pillar trim for a side-curtain airbag system of a vehicle is provided that has a substantially compact construction for preserving the available space within a vehicle.

**[Para 9]** Yet another advantage of the present invention is that a guiding pillar trim for a side-curtain airbag system of a vehicle is provided that has a versatile construction for providing a uniform interior vehicle design while directing the deployment of the side-curtain airbag in a crash event.

**[Para 10]** Other advantages of the present invention will become apparent when viewed in light of the detailed description of the invention when taken in conjunction with the attached drawings and appended claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[Para 11]** For a more complete understanding of this invention, reference should now be made to the embodiments illustrated in greater detail in the accompanying drawings and described below by way of examples of the invention:

**[Para 12]** FIGURE 1 is a perspective view of the interior of a vehicle having a side-curtain airbag system with a guiding pillar trim, according to one advantageous embodiment of the claimed invention;

**[Para 13]** FIGURE 2A is a cross-sectional view of the vehicle shown in FIGURE 1, as taken along line 2-2, illustrating the guiding pillar trim in a trim configuration;

**[Para 14]** FIGURE 2B is a cross-sectional view of the vehicle shown in FIGURE 1, as taken along line 2-2, illustrating the guiding pillar trim in a ramp configuration for directing the deployment of a side curtain airbag in a predetermined direction;

**[Para 15]** FIGURE 3 is an exploded view of the guiding pillar trim shown in FIGURE 1;

**[Para 16]** FIGURE 4A is a perspective view of the guiding pillar trim shown in FIGURE 2A, illustrating the guiding pillar trim in the trim configuration;

**[Para 17]** FIGURE 4B is a perspective view of the guiding pillar trim shown in FIGURE 2B, illustrating the guiding pillar trim moved to the ramp configuration; and

**[Para 18]** FIGURE 5 is a perspective view of the guiding pillar trim shown in FIGURE 4B, illustrating the guiding pillar trim moved to the ramp configuration, according to another advantageous embodiment of the claimed invention.

## DETAILED DESCRIPTION OF THE INVENTION

**[Para 19]** In the following figures, the same reference numerals are used to identify the same components in the various views. Furthermore, the illustrated embodiments described herein employ features where the context permits. Specifically, the embodiments described herein implement a guiding pillar trim for directing downward deployment of a side-curtain airbag from a headliner of a vehicle roof. However, it is contemplated that the guiding trim can instead be utilized in a variety of other suitable environments. For instance, the guiding trim can be utilized for covering other vehicle body structures besides a pillar structure. In addition, the guiding trim can direct the deployment of various other airbags, e.g. a front airbag, in a variety of other directions as desired. In this way, other embodiments are contemplated having different combinations of the described features, having features other than those described herein, or lacking one or more of those features. For these reasons, it is understood that the invention can be carried out in a variety of suitable modes.

**[Para 20]** Referring to Figure 1, there is shown a perspective view of a vehicle 10 having a side-curtain airbag system 12 with a guiding pillar trim 14, according to one advantageous embodiment of the claimed invention. The vehicle 10 generally includes a vehicle body 12, the side-curtain airbag system 12, and a headliner 16 for covering the side-curtain airbag system 12. The vehicle body 18 includes a first pillar 20, a second pillar 22, a third pillar 24, a door assembly 26, and a roof member 28. However, it will be appreciated that the vehicle body 18 can include more or less than three pillar structures as desired. The guiding pillar trim 14 is coupled to the second pillar 22 for covering the second pillar 22. As detailed below, the guiding pillar trim 14 is movable between a trim configuration (shown in Figures 2A and 4A) and a ramp configuration (shown in Figures 2B and 4B) for directing the deployment of a side-curtain airbag in a predetermined direction.

**[Para 21]** Specifically, the side-curtain airbag system 12 includes a crash sensor 30, an inflator device 32 coupled to and actuated by the crash sensor 30, a side-curtain airbag 34 coupled to and inflated by the side-curtain airbag 34, and a guiding pillar trim 14 for directing the deployment of the side-curtain airbag 34 in a predetermined direction. As respectively shown in Figures 2A and 2B, the system 12 is disposable between an undeployed state and a deployed state.

**[Para 22]** In this embodiment, the crash sensor 30 is a piezoelectric accelerometer for detecting a vehicle collision or roll-over incident. For instance, the piezoelectric accelerometer can detect a collision force typically associated with the vehicle crashing into a brick wall while traveling approximately ten to fifteen miles per hour. However,

the crash sensor 30 can instead be utilized for detecting various other collision forces as desired. Also, it is understood that it will be appreciated that the crash sensor 30 can instead be a mechanical accelerometer or various other suitable sensors. Also in this embodiment, the inflator device 32 is a reactor that mixes sodium azide and potassium nitrate to quickly produce a blast of nitrogen gas for inflating the side-curtain airbag 34. However, it is contemplated that the inflator device 32 can be various other suitable inflation mechanisms as desired.

**[Para 23]** With particular attention to Figure 2A, in this embodiment, the side-curtain airbag 34 is concealed above the headliner, stored in a folded position, and coupled to a roof rail 38. The side-curtain airbag 34 is sufficiently positioned for deploying in a generally downward direction and tearing a rip seam (not shown) in the headliner 16. In this embodiment, the system 12 includes a deflector 40 coupled to the roof rail 38 for directing the airbag 34 in the generally downward direction. However, it will be appreciated that the system can omit the deflector 40 as desired.

**[Para 24]** As shown in Figure 2B, the airbag 34 contacts the guiding pillar trim 14 and moves the guiding pillar trim 14 from a trim configuration to a ramp configuration. In this way, the actual deployment of the airbag 34 itself moves the guiding pillar trim 14 to the ramp configuration for directing the airbag in the predetermined direction. This feature is detailed in the description for Figures 4A and 4B.

**[Para 25]** Referring now to Figure 3, there is shown an exploded view of the guiding pillar trim 14 shown in Figure 1, illustrating the construction of the guiding pillar trim 14 in one advantageous embodiment of the invention. The guiding pillar trim 14 includes a panel 44 for covering the second pillar 22 of the vehicle 10. However, as introduced hereinabove, the panel 44 can be utilized for covering the first pillar 20, the second pillar 22, or various other components of the vehicle body structure 18. This panel 44 has a top end portion 48, a lower end portion 50, and a middle portion 52 therebetween. The top end portion 48 of the panel 44 has a guide member 54 coupled thereto.

**[Para 26]** The guide member 54 is releasably attached to the top end portion 48 of the panel 44 and movable between the trim configuration (as shown in Figures 2A and 4A) and the ramp configuration (as shown in Figures (2B and 4B).

**[Para 27]** As best shown in Figure 4A, in the trim configuration, the guide member 54 has a cosmetic surface 56 that is generally aligned with an inboard surface 58 of the panel 44. Specifically, the cosmetic surface 56 has a guide edge 60 that is substantially aligned with a panel edge 62 of the panel. In this way, the cosmetic surface 56 and the inboard surface 58 are aligned for providing a predetermined design to the second pillar 22. For example, in the trim configuration, the cosmetic surface 56 can be aligned with the inboard surface 58 for providing a continuous tubular pillar construction. However, it is contemplated that the surfaces 56, 58 can instead be aligned for providing a continuously tapering thickness to the overall pillar

construction. This feature is beneficial for integrating the guide member 54 within the second pillar 22 and maximizing the available space within the passenger cabin. In addition, this feature substantially conceals the guide member 54 within the second pillar 22 and provides for a predetermined interior vehicle design. It is understood that the cosmetic surface 56 can be aligned with the inboard surface 58 in various other configurations as desired.

**[Para 28]** With reference now to Figure 4B, in the ramp configuration, the guide member 54 has a routing surface 64 that is generally aligned with a deflecting surface 66 of the panel 44 for directing the deployment of the airbag 34 in the predetermined direction. In this embodiment, the routing surface 64 and the deflecting surface 66 are sufficiently aligned for directing the deployment of the airbag 34 away from a seatbelt mechanism 68, which is disposed adjacent to the middle portion 52 of the panel 44. This feature is beneficial for protecting the seatbelt mechanism from being damaged or otherwise hampered by the rapidly inflating airbag 34. Also, this feature can provide the airbag 34 with an unobstructed path for inflating within a substantially short period of time.

**[Para 29]** Referring back to Figure 3, the guiding pillar trim 14 has a series of releasable anchors 70 extending therefrom for inserting into a series of apertures 72 formed within the panel 44. The releasable anchors are tabs with one or more resilient detent flanges for attaching to the panel 44. In this way, the guiding member 54 is secured in the trim configuration until sufficient force is applied to the guide member 54 for deforming the resilient detent flanges. However, it is understood that the releasable anchors 70 can instead have various other suitable constructions as desired. Also, the panel 44 can instead have the releasable anchors 70 extending therefrom with the guiding member 54 having the apertures 72 formed therein for receiving the releasable anchors 70. Additionally, it is also contemplated that more or less than six releasable anchors 70 and six apertures 72 can be utilized as desired.

**[Para 30]** The guide member 54 further includes a load-receiving portion 74 for contacting the inflating airbag 34 and moving the guide member 54 from the trim configuration to the ramp configuration. In this embodiment, the load-receiving portion 74 is a top edge of the guide member 54 that is disposed in the path of the inflating airbag 34. In this way, the airbag 34 contacts the load-receiving portion 74 with sufficient force to remove the releasable anchors 70 from the apertures 72 in the panel 44 and move the guide member 54 to the ramp configuration 76.

**[Para 31]** Moreover, the guide member 54 and the panel 44 have two tether members coupled therebetween for securing the guide member 54 in the ramp configuration as the airbag 34 after the airbag 34 has detached the releasable anchors 70 from the panel 44. In one embodiment, the tether members 80 extend from the guide member 54 for insertion into a hole 82 formed in the panel 44. However, it is understood that more or less than two tether members 80 can be utilized and also that the tether members 80 can instead extend from the panel 44 for insertion into the

guide member 54 as desired. The tether members 80 sonic welded to the panel 44. It will be appreciated that the tether members 80 can instead be heat stakes with bosses or have various other suitable constructions as desired.

**[Para 32]** In another embodiment shown in Figure 5, the guide member 54 and the panel 44 have a hinge element 84 coupled therebetween for moving the guide member 54 from the trim configuration to the ramp configuration. Also, in this embodiment, the guide member 54 and the panel 44 having a biasing member 86 coupled therebetween for biasing the guide member to the trim configuration. The force of the inflating airbag is sufficient for moving the guide member from the trim configuration to the ramp configuration.

**[Para 33]** While particular embodiments of the invention have been shown and described, numerous variations and alternate embodiments will occur to those skilled in the art. Accordingly, it is intended that the invention be limited only in terms of the appended claims.